

Impacts of Climate Change Response on Industries

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Amid heightened attention being paid to climate change since the outbreak of COVID-19, international society is stepping up its efforts to achieve carbon neutrality. Korea has also come up with a related Action Plan, after announcing last year its plan to be carbon neutral by 2050, and it has recently published a draft scenario for the plan. Given that carbon neutrality entails carbon emission cuts, industries are expected to encounter some adverse effects over the course of achieving that goal. In particular, the extent of adverse effects are likely to differ by industry, as the volume of carbon emissions varies. This paper looks at the current status of carbon dioxide emissions by industry since 2000, and analyzes the implication of carbon taxes on industries in terms of production costs and industrial structure.

The volume of carbon dioxide emissions by domestic industries increased on average by 4.8% per year between 2001 and 2018, and is estimated to have reached 530 million tons as of 2018. By industry, emissions from the manufacturing sector accounted for a large share (65.9% as of 2018), among which the shares of primary metal products (25.2%), chemical products (12.5%) and coal & petroleum products (7.2%) were relatively high. In the services sector, emissions from transportation services (13.7%) accounted for the second largest share of all industries. Structural decomposition showed that, despite efforts such as technological development, a rapid expansion in domestic and global demands has caused an increase in carbon dioxide emissions. The main drivers of carbon dioxide emissions include elevated demand for exports of primary metal products and chemical products, and heightened domestic demand

for transportation and restaurants & accommodation services.

In order to assess the impact of limiting carbon emissions through carbon pricing (a carbon tax) on industrial structure and production costs by industry, without green technology or green policies, the carbon tax was set at different rates for each industry, using the scenario analysis from NGFS (2021) as reference. (Scenario 1 limits the increase in the global average temperature to between 1.5 and 2.0 degrees above pre-industrial levels. Scenario 2 limits the increase to below 1.5 degrees above pre-industrial levels.) Production costs were estimated to be rise at higher rates for the manufacturing sector compared to the services sector, with primary metal products (0.8%-4.5% on average per year between 2020 and 2050) showing the highest rate of increase, followed by processed metal products (0.6%-3.5%) and transportation equipment (0.5%-3.0%). By transmission channel, indirect effects via other industries were found to be more significant than any direct effects. Regarding industrial structure, the manufacturing sector is projected to shrink in terms of its share. In particular, the shares of transportation equipment (0.02%p-0.25%p on average per year between 2020 and 2050) and primary metal products (0.01%p-0.14%p) diminished by larger margins. Nevertheless, if substitutions among production factors resulting from changes in input prices, new government policies and technological improvements were to occur, the actual impact could be smaller.

The implementation of regulations on carbon emissions could result in a contraction of production, particularly in the manufacturing sector, if not accompanied by efforts to cut emissions. Considering that the rise in carbon dioxide emissions associated with the manufacturing sector was driven by expanded exports, a downturn in the sector would likely lead to a reduction in exports. Therefore, in order to minimize adverse effects created over the course of the transition to carbon neutrality, efforts must be made not only at the

company level, including shifting to low-carbon energy sources and enhancing energy efficiency, but also at the government level by providing various support measures, such as providing financial assistance for the installation of aftertreatment systems and incentives for reducing energy consumption. In particular, certain industries that do not produce large amounts of carbon emissions in their production process are still expected to suffer significant damage, including higher production costs and production reductions via indirect channels. Therefore, it is important to accurately assess the degree of damage expected in each industry.

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